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Valuation of an Equity Swap

As explained in Chapter 32 an equity swap is always worth zero immediately after a payment date. To value an equity swap between two payment dates, we define

R_0: Floating rate applicable to the next payment date (determined at the last payment date)
L: Principal
τ_0: Time between last payment date and next payment date
τ: Time between now and next payment date
E_0: Value of the equity index at the last reset date
E: Current value of the equity index
R: LIBOR rate for the period between now and the next payment date.

If we borrow

$$\frac{E}{E_0}L$$

at rate R for time τ and invest it in the index, we create an exchange of

$$\frac{E_1}{E_0}L \qquad \text{for} \qquad \frac{E}{E_0}L(1+R\tau) \tag{1}$$

at the next payment date. Since this exchange can be created costlessly it is worth zero. The exchange that will actually take place at the next payment date is

$$\left[\frac{E_1}{E_0}-1\right]L \qquad \text{for} \qquad R_0L\tau_0$$

Adding the principal L to both sides we see the actual exchange is equivalent to

$$\frac{E_1}{E_0}L \qquad \text{for} \qquad L(1+R_0\tau_0) \tag{2}$$

Comparing equation (1) with equation (2) see that value of the swap to the party receiving floating is the present value of

$$L(1+R_0\tau_0)-L\frac{E}{E_0}(1+R\tau)$$

This is

$$L\frac{1+R_0\tau_0}{1+R\tau}-L\frac{E}{E_0}$$

Similarly, the value of the swap to the party receiving the equity return is

$$L\frac{E}{E_0}-L\frac{1+R_0\tau_0}{1+R\tau}$$